

REMARKS

The contents of the Final Office Action of January 23, 2008 have been carefully considered. The Applicant, by way of this Response, wishes to clarify the salient features of the present invention with respect to *Yamauchi*. The Applicant respectfully requests the Examiner to reconsider the following comments.

No amendment to the claims is submitted in this Response. All claims remain as submitted in the Amendment and Response filed on October 31, 2007. Claims 25, 26, 28, 29, 31-34 and 36-47 are currently pending in the instant application.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 25, 26, 28, 29, 33, 34, 42-45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yamauchi* in view of *Malone*. The crux of the rejection hinges solely on the question whether it would be obvious to one of ordinary skill in the art to modify *Yamauchi* by placing control circuit 21 inside optical package body 2 because longer wires introduce noise and instability into the system. The Applicant submitted the contrary on the ground that said modification will defeat *Yamauchi*'s invention. The Applicant elaborates in greater details in subsequent paragraphs.

Noise By Wires

The Office suggested that placing control circuit 21 inside optical package body 2 is advantageous in that longer wires introduce noise and instability into the system. The Applicant submits that the concern is a generic statement and whilst the statement is a true statement, the statement may not be applicable in *Yamauchi*'s invention. *Yamauchi* neither discloses that signal noise attributed to wires 1C, 3B and 4B connecting external control circuit 21 with package body 2 is present nor

signal noise is a concern at all. On the other hand, *Yamauchi* addresses the concern of heat transfer via wire 1C to some extent and dismisses that concern (see Column 6 lines 31-34). One may logically deduce that the concern of signal noise (if any) attributed to said wires may not be significant to the operation of the invention. If such deduction holds truth, there is no problem (concerning signal noise caused by said wires) to be solved at the first place and hence no motivation to place control circuit 21 inside package body.

However, giving the benefit of doubt to *Yamauchi's* invention that wires 1C, 3B and 4B do pose signal noise significant to impact the invention, one of ordinary skill in the art will appreciate that placing control circuit 21 within package body 2 may pose unwanted problems. One of the problems is the noise caused by control circuit 21. It is well known in the art that circuits generate noises via the circuit elements such as transistors, RAM devices, ROM devices and line drivers, all of which are commonly found in circuits. If one skilled in the art attempts to place control circuit 21 inside package body 2, the skilled person must also consider the effects of signal noise generated by control circuit 21 on other components in package body 2. For example, it is well known that thermister 4A is generally made of high impedance material and thus making thermister 4A highly susceptible of picking up noises. By placing noise-generating control circuit 21 inside package body 2 (thus nearer to thermister 4A and other components inside package body 2), one of ordinary skill in the art will appreciate the risk of causing the components to malfunction and/or yield inaccurate signals. For the sake of avoiding any doubt, the Applicant is not asserting that the noise generated by control circuit 21 is an absolute concern in *Yamauchi's* invention. The Applicant nevertheless believes that if wires 1C, 3B and 4B in fact do pose a real noise problem (thus motivates a person skilled in the art to place control circuit 21 inside package body 2), a reasonable person of

ordinary skill in the art will invariably consider the effects of noise generated by control circuit 21 on the operations of all components inside package body 2 in tandem with the noise associated with long wires (if any).

Effect of Placing Control Circuit Inside Package Body

The Applicant asserted in the previous Response that *Yamauchi's* invention will be defeated if control circuit 21 is placed inside package body 2 in that the heat generated by control circuit 21 will disrupt the operation of the laser. The Office disagreed.

It is still the Applicant's understanding that placing a heat source inside package body 2 will defeat *Yamauchi's* invention. To illustrate this point, it is imperative to first understand the problem *Yamauchi* attempts to solve, the solution it proposes and how the invention will be defeated if a heat source is placed in package body 2 based on the disclosure in *Yamauchi*.

Yamauchi attempts to resolve an erroneous operation of the wavelength locker that occurs when there is a temperature difference between laser diode 1 and optical wavelength filter 6 as a result of change in the temperature of environment the module is used (see Column 2 lines 49-57). One salient feature of the invention is the establishment of an intentional thermal coupling between laser diode 1 and the environment via a number of bonding wires 9 (see paragraph [0048] and Fig. 5A). A rise in environment temperature will cause the temperature of optical filter 6 to rise as well and transmittance curve of optical filter 6 to shift to longer wavelength (see Column 5 lines 42-46). At the same time, heat outside package body 2 is transferred to laser diode 1 via bonding wires 9 and causes a corresponding temperature rise in laser diode 1 (see Column 5 lines 47-53). Subsequently, Peltier element 3A is

activated by control circuit 21, and laser diode 1 is cooled and the laser oscillation wavelength is shifted to the original wavelength (see Column 5 line 65 to Column 6 line 3).

Yamauchi's invention will be defeated when a heat generating circuit is placed inside the closed package body 2. In a first scenario where the temperature of environment remains constant, heat from control circuit 21 will cause the temperature of optical filter 6 to rise and shift the transmittance curve to longer wavelength. However, as the heat comes from the internal of package body 2, no additional heat will be transferred to laser diode 1 via bonding wires 9. In this regard, Peltier element 3A will not be activated to cool laser diode 1 and the laser oscillation wavelength will not be shifted to original wavelength.

In a second scenario where the temperature of environment rises, the additional heat generated by control circuit 21 (in addition to the heat from environment) will cause higher temperature rise to optical filter 6 as compared to laser diode 1 which receives only heat transfer from the environment via bonding wires 9.

The Office suggested that the rise of temperature inside package body 2 will not affect laser diode 1 and optical filter 6 disproportionately. It is the Applicant's understanding that control circuit 21 is likely to create a hotspot in enclosed package body 2 and results in optical filter 6 receiving more heat relative to laser diode 1 or vice versa. It is well known that hotspot is common in a closed space where heat transfer is retarded. *Yamauchi* disclosed that package body 2 is sealed in a vacuum or reduced pressure state (see Column 7 lines 14-15). *Yamauchi* also suggested filling the space within package body 2 with N₂ or Ar gas to retard penetration of heat from environment into optical filter 6 (see Column 7 lines 15-20). The Applicant

submits that laser diode 1 and optical filter 6 will be exposed to the heat generated by control circuit 21 in a different extent.

The Office substantiated the assertion that rise in temperature inside package body 2 will not affect laser and filter disproportionately as *Yamauchi* provides for installing a desired number of wires based on temperature requirement. It is the Applicant's understanding that the number of bonding wires 9 cater for the amount of heat transferred from outside of package body 2 to laser diode 1 so that laser diode 1 will experience a corresponding temperature rise in the environment the module is used. However, bonding wires 9 are of no application in relation to responding to and regulating temperature rise inside package body 2. The Applicant further observes that if laser diode 1 and optical filter 6 do hypothetically experience the rise in environment temperature proportionately, then bonding wires 9 in *Yamauchi* would be a redundant feature and heat transfer from outside of package body 2 to laser diode 1 via bonding wires 9 would not be required at the first place.

The Office also suggested that a TEC can be placed underneath control circuit 21 to reduce the heat generated by control circuit 21. If control circuit 21 is placed on temperature regulation block 3 (which includes Peltier element 3A), temperature regulation block 3 will always be turned on as control circuit 21 operates continuously by processing signals fed via wires 1C, 4B and 3B. The temperature control of laser diode 1 will be invariably distorted. It is therefore not viable to place control circuit 21 on temperature regulation block 3. On introducing a separate TEC for the purpose of reducing the heat generated by control circuit 21, the Applicant submits that a reasonable person skilled in the art would not deliberately introduce a problem and attempt to solve it when there is no motivation at the first place to shift control circuit 21 into package body 2.

The Office cited *Malone* and Patent 6,747,820 in support that one of ordinary skill would be motivated to incorporate the teaching in *Malone* into *Yamauchi* by placing control circuit 21 inside package body 2 in order to reduce noise associated with long wires. As elaborated in above paragraphs, the Applicant submits that such motivation (to reduce noise associated with long wires) can be defeated as placing control circuit 21 inside package body 2 may introduce a new problem, i.e. noise generated by control circuit 21 affecting the components inside package body 2. As such, one skilled in the art would not incorporate the teaching of *Malone* in *Yamauchi*.

In view of the above, it is submitted that independent claim 25 is patentable over *Yamauchi* in view of *Malone*. Claims 26, 28, 29, 33, 34, 41-45 are further patentable over *Yamauchi* in view of *Malone* by virtue of their dependency from claim 25, and further for the particular additional features that they recite.

Watts, *Acklin*, *Rosenberg* and *Stewart* have been used in combination with *Yamauchi* in view of *Malone* to reject claims 31, 37-39, 40 and 32, 36, 46, 47 respectively. Neither *Watts*, nor *Acklin*, nor *Rosenberg*, nor *Stewart* do anything to overcome the deficiencies of *Yamauchi* or *Yamauchi* in view of *Malone*. Thus, claims 31, 37-39, 40 and 32, 36, 46, 47 are likewise patentable over the cited combination of references by virtue of depending from independent claim 25, and further for the particular additional features that they recite.

In view of the above, the Office is respectfully requested to reconsider the above remarks, withdraw the rejection of the claims under section 103(a) and grant early allowance of the claims.

Pursuant to 37 C.F.R. § 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. §§ 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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